SPECIAL CIRCULAR 111 JUNE 1985

Surface-Applied Soil Conditioner and Flow from Pipe Drains in a Silty Clay Soil

G. O. SCHWAB

E. D. DESMOND

The Ohio State University
Ohio Agricultural Research and Development Center
Wooster, Ohio

CONTENTS

*

AGDEX 554-752

6-85-2.5M

Surface-Applied Soil Conditioner and Flow from Pipe Drains in a Silty Clay Soil

G. O. SCHWAB and E. D. DESMOND[1]

INTRODUCTION

Increasing numbers of nonconventional soil additives are becoming available commercially. Such an additive is defined as any nonfertilizer material applied to soil or plants to improve physical, chemical, or other soil characteristics; to improve crop yields or quality; or a fertilizer material used in an unconventional manner. By 1983, more than 200 such products were on the market in the North Central region of the U.S. (1). At least nine of the suppliers made claims that their product made the soil more porous, improved the downward water movement, made tillage easier, or gave other benefits related to drainage. As of 1982, 10 of 12 North Central states (including Ohio) had laws relating to soil and plant amendments.

The purpose of this research was to evaluate one of these nine materials under field conditions by measuring the peak rate of flow from pipe drains before and after treatment. Peak flow rates were compared because drain flow data showed that the volume of flow for each storm was similar in all plots with the same drainage system and thus no difference could be expected.

PROCEDURE

Tests were conducted at the OARDC North Central Branch near Vickery, Ohio. The soil was mostly Toledo silty clay, described by Schwab *et al.* (4). Flow measuring equipment, soil and crop management practices, drain flows, crop yields, and water quality for the 25-year period (1958-82) are reported by Schwab *et al.* (2, 3, 4).

The layout of the plots is shown in Figure 1. Four of the 16 plots were selected for the study—1E, 2E, 3E, and 4E. In all four plots the subsurface drains were 2-inch diameter corrugated plastic tubing installed at an 18-inch depth and 20-foot spacing (six drain lines per plot). Flow was measured from the two center lines, each 200 feet in length. Peak flow rates were obtained from continuously recording charts on V-weirs installed for that purpose. The area drained was 40 by 200 feet or 0.18 acre in each plot. Tubing was installed in late 1969. Surface drainage was poor, but it could take place across the rows toward the east and west sides of the plots. From 1957 to 1969

[1]Professor and Research Assistant, Dept. of Agricultural Engineering.

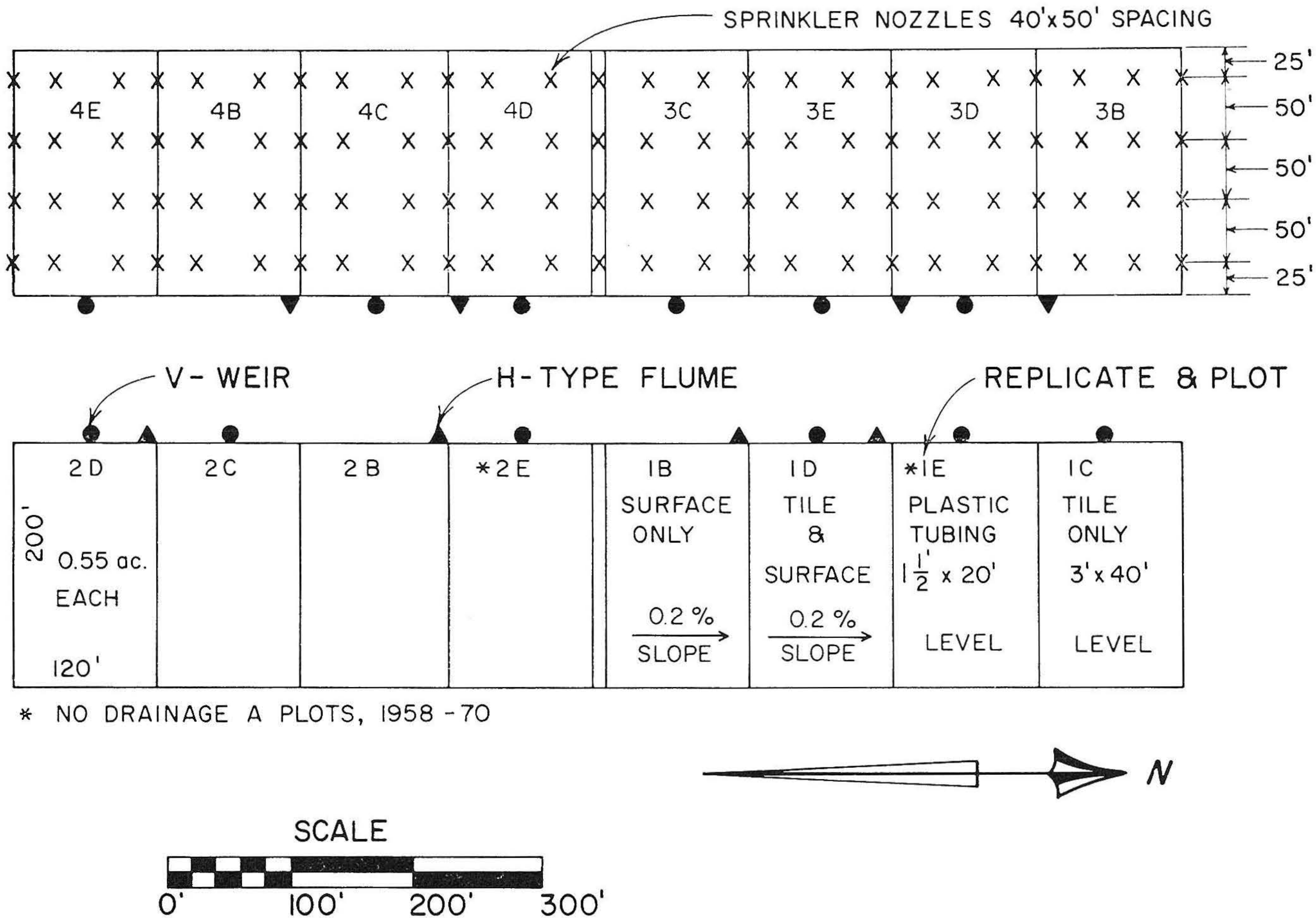

FIG. 1.—Field plot layout (1970 and later) and sprinkler system (1964 and later).

TABLE 1.—Average Peak Flow Rates for Control Plots and Treated Plots

Years of Record	Number of Storms	Average Rainfall per Storm, inches	Average Peak Flow, inches per Day 1E	3E	4E	2E	Plot Differences
Before Treatment							
1972-81	132	1.00	0.61	0.72			0.11
1972-75, 1981	59	0.84			0.46	0.59	0.13
After Treatment							
1981-82	23	1.03	0.56	0.62*			0.06
1981-82	23	0.91			0.36	0.46†	0.10

*4 oz per acre application.
†8 oz per acre application.

all four plots were undrained, but were planted with the same crop and treated alike.

The surface-applied conditioner was supplied by Four Star Agricultural Services, Inc., Bluffton, Ind. It was applied with a 3-gallon hand sprayer in a diluted solution at rates recommended by the supplier on plots 2E and 3E at 4 and 8 oz per acre, respectively.

Prior to applying the soil conditioner, peak flow rates from plots 1E and 3E were compared for 132 storms for the period 1972-1981, as shown in Table 1. Plots 2E and 4E were compared using 59 storms for the years 1972-75 and 1981. The number of storms was less for these plots than for plots 1E and 3E because flows were not recorded in some years.

On plot 3E, the conditioner was applied at a rate of 4 oz/acre on May 8, 1981, and again on May 18, 1982. On plot 2E, 8 oz/acre was applied on the same dates. The soil surface was essentially bare at the time of application. Selection of the paired plots (1E vs. 3E and 2E vs. 4E) was at random with no prior evaluation of past flow rates.

After the conditioner was applied, peak flow rates were compared from plots 1E and 3E for 23 storms in 1981 and 1982. Plots 2E and 4E were compared for the same period for 23 storms. The storms compared by 1E and 3E are not necessarily the same as those compared to 2E and 4E.

RESULTS

The average peak flow rates for the control plots and the treated plots were higher for the base period than for the 1981-82 period, as shown in Table 1. The differences before and after treatment for the paired plots are shown in Table 2. For both the 4 and 8 oz/acre ap-

TABLE 2.—Peak Flow Rate Differences Before and After Treatment.

Agri-SC Application, oz per Acre	Peak Flow Rate, inches per Day		
	Difference Before Treatment*	Difference After Treatment*	Agri-SC Effect
4	0.11	0.06	—0.05†
8	0.13	0.10	—0.03†

*Differences between paired plots for the same storms (see Table 1).
†Not significantly different at the 95% level.

plications, these differences were lower after treatment, suggesting a negative rather than a positive effect on peak flow rates. A statistical analysis showed that these negative differences were not significant at the 95% level.

The conclusion from this study is that the soil conditioner made no difference in average peak drain outflow rates from natural rainstorms during the period May 1981 to September 1982 compared to an earlier base period. No further measurements or observations were taken after September 1982.

REFERENCES

1. Kelling, K. A. and Schulte, E. E. (Chr.). 1983. Nonconventional Soil Additives, Products, Companies, Ingredients and Claims. NCR-103 Committee on Nontraditional Soil Amendments and Growth Stimulants. Mimeographed.
2. Schwab, G. O., N. R. Fausey, E. D. Desmond, and J. R. Holman. 1985. Tile and Surface Drainage of Clay Soils, Parts IV to VII. The Ohio State Univ., Ohio Agri. Res. and Dev. Ctr., Res. Bull. 1166.
3. Schwab, G. O., N. R. Fausey, and C. R. Weaver. 1975. Tile and Surface Drainage of Clay Soils. II. Hydrologic Performance with Field Crops. III. Corn, Oats, and Soybean Yields. Ohio Agri. Res. and Dev. Ctr., Res. Bull. 1081.
4. Schwab, G. O., T. J. Thiel, G. S. Taylor, and J. L. Fouss. 1963. Tile and Surface Drainage of Clay Soils. I. Hydrologic Performance with Grass Cover. Ohio Agri. Exp. Sta., Res. Bull. 935.

This page intentionally blank.

OSU

The Ohio State University

Ohio Agricultural Research and Development Center

Wooster, Ohio